



April 10, 2023

Chairman Christian Klein and  
Members of the Zoning Board of Appeals for the Town of Arlington  
23 Maple Street  
Arlington, Massachusetts 02476

**Re: 1021-1025 Massachusetts Avenue  
Arlington, Massachusetts**

Dear Mr. Klein & Members of the Board of Appeals:

Patriot Engineering LLC (Patriot) is pleased to submit this letter in support of the sanitary sewer capacity for the proposed residential project located at 1021-1025 Massachusetts Avenue.

In response to the comment below received as part of Tetra Tech's review of the project:

*We recommend the applicant provide a simple memorandum or similar documentation by a licensed Massachusetts engineer demonstrating the Project can be served adequately without impacts to existing or proposed infrastructure or its users. At a minimum the documentation should describe and quantify proposed demand, describe existing infrastructure serving the site, provide calculations demonstrating available capacity/service and describing improvements, if any, needed to town infrastructure to serve the Project. If offsite infrastructure improvements are required to serve the Project, please note them clearly in the memorandum. Documentation is requested as a factual basis on which the Board can rely in determining the Project can be safely served by local infrastructure. It is not intended to suggest issues may exist.*

The proposed building will contain 50 residential units when complete. To analysis the sanitary flow from the project the total proposed numbers of bedrooms of 97 is used to determine the base sanitary flow for the project. Using the 110 gallons per day (GPD) per bedroom established in 310 CMR 15 (Title 5 of the State Environmental Code) the total average daily flow from the project can be calculated.

$$97 \text{ BEDROOMS} \times 110 \text{ GPD} / \text{BEDROOM} = 10,670 \text{ GPD}$$

A peaking factor of 5.0 is applied to the average daily flow to yield an average daily flow of 53,350 GPD (10,670 \*5). This is equal to 37.05 gallons per minute (53,350 gpd /1440 min).

Then converting 37.05 gallons per minute to cubic feet per second (CFS) using [(gallons per minute (gal/min) is equal to  $2.22801 \times 10^{-3}$  cubic feet per second (ft<sup>3</sup>/s)] yields an average peaked flow of 0.0825 CFS.

The capacity of the existing sanitary sewer is examined based on record plans with the Town of Arlington Engineering Department showing a 12-inch diameter main line with a slope of 0.95%. Using Manning's equation, the capacity of the existing sanitary line is determined:



### **Manning Equation:**

$$Q = VA \quad V = \frac{k}{n} \left( \frac{A}{P} \right)^{2/3} S^{1/2}$$

k is a unit conversion factor: k=1.49 for English units (feet and seconds). k=1.0 for SI units (meters and seconds).

A=Flow area of the pipe, culvert, or channel.

P=Wetted perimeter which is the portion of the circumference that is in contact with water.

Q=Discharge (flow rate).

S=Downward (longitudinal) slope of the culvert.

V=Average velocity in the pipe, culvert, or channel.

The result of Manning's equation for the half full capacity of the existing 12-inch diameter sewer main in Massachusetts Avenue that the project will connect is 1.74 CFS.

Therefore, the project peak sewer flow of 0.0825 CFS is less than the half full capacity of the existing sewer main (1.74 CFS) showing available capacity.

The condition of the existing sewer main was evaluated on March 31, 2023. Three manholes were opened: the manhole directly upstream of the project, the manhole within the project frontage and the manhole directly downstream of the project. Each manhole was observed to be free flowing and showing no evidence of back up at the time of observation. Each manhole also showed no sign of historical back up as the manhole's shelves were clean and the structure was deemed to be in good shape. The observation began at approximately 830am on 03/31/2023. Pictures of each manhole have been included with this letter.

We anticipate this information addresses the comment issued by Tetra Tech. Should you have any questions or require any further details, please feel welcome to email to [mnovak@patriot-eng.com](mailto:mnovak@patriot-eng.com)

Sincerely,  
**PATRIOT Engineering LLC,**

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Patriot Engineering LLC  
35 Bedford Street, Suite 4  
Lexington, MA 02420



UPSTREAM



AT PROJECT



DOWNSTREAM

